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New Method of Cohesion of Water and Adhesion of Mercury Apparatus

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NEW METHOD OF COHESION OF WATER AND ADHESION OF MERCURY APPARATUS.

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The difficulty of manipulating the ordinary apparatus in finding the cohesion of water and other liquids has thrown this beautiful and instructive laboratory experiment out of the reach of most students of Physics. Professor Nichols of Cornell University, says of this experiment: "The difficulties of controlling the conditions are so great, that the determination is one not to be recommended to the beginner." The first difficulty has been to accurately adjust the glass plate used in the experiment so that it will be parallel to the surface of the liquid to be tested; next, on account of the tension applied in separating the portion of the liquid tested the cords stretch, so that it is no longer parallel to the surface of the liquid, and one edge of the disk will come off from the water too soon, thus splitting the particles of the water a little at a time, instead of separating the water area equal to the cross section of the disk all at once.

The ordinary way of attaching the disk to one arm of a scale beam by means of pieces of cork glued to the glass, and guy cords is shown in fig. 1. The difficulties mentioned above can be entirely overcome, and the experiment rendered suitable for even elementary laboratory work by suspending the glass disk in the following way. Upon the lathe turn out a wooden cone which is about

one-half inch less in diameter than the glass disk. The cone should have an altitude of about six inches. The altitude depends somewhat upon the size of the scales used. The cone must be accurately turned and the base must be trued up while the piece is still in the lathe. Fasten the glass disk to the base of the cone by means of

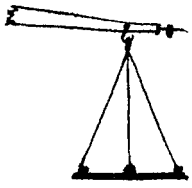


FIG. 1.

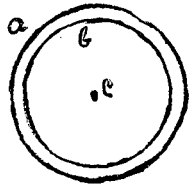
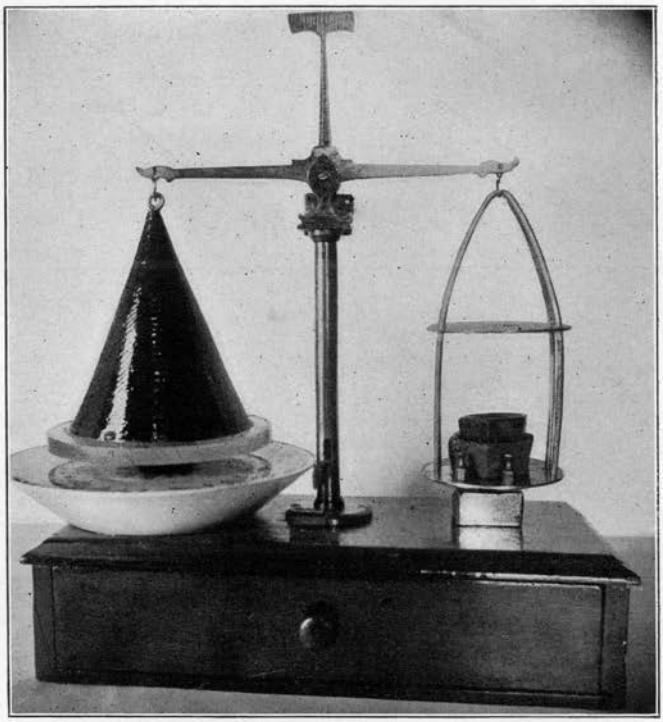


FIG. 2.

any good laboratory wax. I have found it to be the most satisfactory to use a wax that will melt at a low degree of heat. The glass can be heated to a degree sufficient to melt the wax over an asbestos pad placed upon a ring stand above a flame. As the wax melts flow it around evenly on the upper side of the disk, and set the base of the cone in it. To center the cone upon the disk previous to melting the wax a circle (a) fig. 2, the exact diameter of the glass disk should have been marked on a piece of paper. Using the same center (c) mark out another circle (b) having the same diameter as the base of the cone. Slip the paper under the glass disk on the asbestos pad, and place it so that the circumference just coincides with the circle (b). If the wax is not too thick and opaque the inner circle can be seen through the glass, and serves to locate the base of the cone so that it is equally distant from the circumference of the glass disk. A small hook can be accurately screwed into the apex of the cone for suspending it to the scale beam.

The glass disk should be made of plate glass not less than one-fourth inch in thickness, and if it is one-half inch it is all the better. The disk can be made by first cutting out a plate as nearly round as possible with a good glass cutter. Corners of glass can be broken off after cutting with the glass cutter by clamping between pieces of hard wood in a vice, and suddenly pushing the free part of the

PLATE XV.



Method of cone suspension in apparatus for finding the cohesion of water.

glass to one side. When as round as it is possible to cut it with a glass cutter fasten it to a small face plate of a lathe by means of little soft wax balls. A wooden face plate held in a chuck will serve the purpose. For the cutting instrument use a sheet-iron strip some two inches wide, and of a length a little more than the circumference of the disk when finished. Bend it into a circular form, and after having put emery paste on the inner side, hold it, by means of the hands, firmly around the circumference of the rapidly revolving disk. The emery paste is made by mixing emery powder with water. A course emery should be used at first, and the final cutting should be done with fine emery. The complete apparatus is shown in plate xv. The advantages of the cone suspension over the old methods are: first—it gives a rigid support, and if accurately constructed it will always hang parallel to the surface of the water, and the disk will come away from the water all at once instead of separating the water a little at a time. Second—the cone gives stability to the apparatus, which adds much to the accuracy as well as to ease of manipulation.